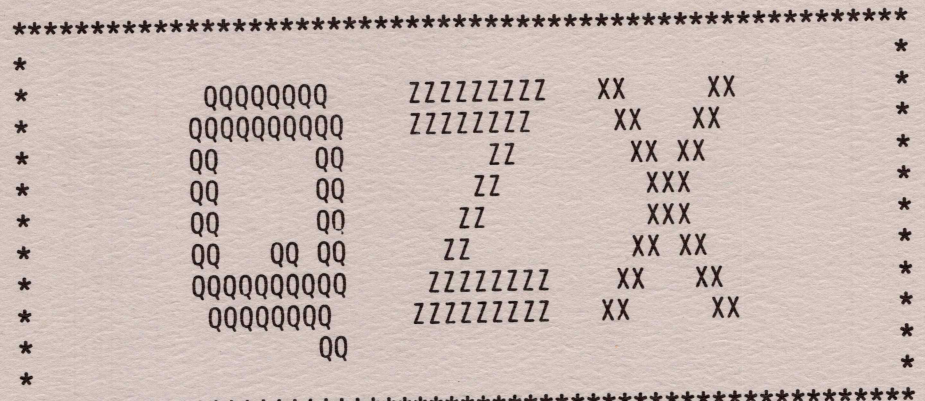

The Journal Covering Amateur Radio & Sinclair Computers
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K5XY
Alex. F. Burr
Publisher

W4GHV
Bo Barry
Editor

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Editor's Comments - W4GHV

Some of you may have noted I came up with a daisy wheel printer for the last issue. It's not mine, but it sure beats my wire matrix printer. A $2000 laser printer is not even in the forecast here.

Thanks to the nice (and long) article from Bob Howard and several other interesting articles, we will be able to get both the October and November issue put together in short order. Alex and I are doing OK putting the pieces together, with our 1700 mile 'gap', except for my total lack of organization. I have QZX stuff in piles throughout my tiny apartment, and at work, and I have lost control of what is where! I apologize for the letters that don't get answered, I won't have things sorted out until I move into a bigger place next year.

I don't know how I am going to find room or time for another computer, but I have to admit the QL 'kit' offer looks too good to pass up! I took a 68000 course from Motorola, have a lot of info on it, and really think it is a super-slick chip. I have one of the Motorola 68000 educational boards but haven't been able to do a lot with it due to lack of utility software. It's a dream to program, but I don't have an operating system for it. I recently came across an ad in Byte Magazine offering 68000 software for the Atari, Amiga, and QL. Offered are: Lattice C, Pascal, Assembler, Lisp, and BCPL. The C language is on my list of languages to learn (I gave up trying to learn Spanish), and I am definitely interested in the assembler. I plan to give the QL a try, and will report on this software if I can get details or if I purchase it. You may want to write them direct: Metacomco, 5353 #E Scotts Valley Drive, Scotts Valley, CA 95066.

WA6DLI

Bob Howard, WA6DLI, is a very active Sinclair user as his articles in QZX show. He has given us other comments and many pictures of his computer set up and programs. He has a lot of interesting comments on equipment too.

He is still very satisfied with his T/S 2068 especially with the new programs published in 1986 by Novelsoft out of Canada for the 2068 and Spectrum. TIMACHINE is a really good compiler and ARTWORX is a neat drawing program, each only $19.95. He has added a RGB monitor and the Olinger disk drive system with Amdek 3 inch drives. He has just purchased some 3.5 Shugart SA-300 drives to replace the Hitachi 3 inch drives which will go on his new QL which he built from a $139 kit. He could not resist the color Mac type computer with better BASIC than either the mac or Atari 520/1040.

The 3.5 inch drives were from Digital Search, 103 S. Main St. Green, SC 29651 at 2 for $75 used or $90 each new. he was not able to find any place to buy these before. They are pulled from equipment and 'new' means checked out, the used ones are unchecked but look new to him. A manual is $10 extra. These are quad density because of the 80 tracks so they hold 500 K per side of disk unformatted. A true double sided NEC 3.5 inch is available for $179 new.

Bob really has a fancy set up which includes an external keyboard connected to the computer by an infra-red transmitter.

He has sent us a large number of color pictures of his screens which we wish we could reproduce here. They are pretty easy to take. He uses a new Polaroid Spectra camera. He just sets it on AUTOEXP and turns the flash off. The pictures come out very clear. Some of the programs which generated the screens he sent us include G1FTU's no interface RTTY program, a German Sat-Bahn satellite tracking program which features a world map, an OSCAR program from QZX, a colorful MUF program to which he contributed, a G1FTU slow scan TV program, and some tutorial programs.

QL KIT OFFER

The QL is available in kit form! If any of you want the least expensive way to get a QL, READ ON. A+ Computing and some dealers are selling QL kits. These kits come with a completely assembled main circuit board and all the other pieces to enable you to assemble a complete QL. Neither Bo nor I have actually assembled one, but WA6DLI has and he is completely satisfied.

Carol Whitham of A+ Computing said that it takes about one hour to put the pieces together and that no soldering is required. I think she must have been thinking of a trained assembler because I am sure it would take me longer, but the assembly was designed to be done easily. The power regulator and its associated heat sink, for instance, plugs into a socket with no soldering needed.

The kit does come with some instructions, but they are not like the Heathkit assembly manuals. The kits do not include the four application programs - word processor, data base, spreadsheet, and graphics. These programs are available

separately from A+ Computing ($50) and some dealers. The kit does include SUPERBASIC however. And SUPERBASIC is all you need to use your own or a purchased terminal program to get a good packet computer.

A+ Computing is selling kits for $139 plus $7 for shipping and handling for a total of $146. Some dealers also offer this or slightly higher prices. QZX can make arrangements with A+ computing for a User's Group purchase if enough of our readers want them. We would have to charge $130, shipping included (to continental US only) (a $16 saving). At this price there would not be any money left over for adjustments or large amounts of personal help and it depends on enough readers wanting to get one.

If you want one, send us a check for $130. I will not cash the check until the unit has been shipped to you. If enough readers do not sign up, all checks will be returned within seven weeks.

QL MARKET STATUS

Interviews with QL industry people give some indication of how the QL is selling and what the future might be.

Frank Toemay of Quantum Computing (see ad in this issue) says that already other manufactures are making clones of the QL. The clones cost more than the real thing, however. We have heard no news of Amstrad making any arrangements for the use of the QL technology.

Carol Whitham, general manager of A+ Computing, says that sales have not been as great as anticipated. However A+ Computing is mounting an advertising campaign, have put together a catalog, and are trying to stimulate sales by their dealers. I tried to find out how many US QL's were left and got the answer "piles". The catalogs from dealers seem to offer a reasonable amount of software so one can expect more considering the number of QL's which have been sold and which will be sold.

The US QL is a bit different than the British variety although they do run the same software. The basic works are the same but the FCC caused more attention to RFI protection in the US model, a big plus for us amateurs. More shielding has been added to the keyboard region and extra bypass capacitors have been sprinkled throughout the interior.

Everybody has just about run out of the Sinclair RGB color monitor. In one way that is too bad because it came with a cord and was designed to match the QL and not all color monitors are compatible. Fortunately, A+ Computing has found a Magnavox RGB monitor which works just fine and which is in the same price range as the Sinclair monitor. Most dealers also have available an inexpensive B & W Magnavox monitor too. These monitors can also be made to work with the T/S 2068.

UNCLASSIFIED ADS

WANTED: UNCLASSIFIED ADS for publication in QZX. Cost is 1 cent for each keystroke (characters, blanks, etc.). Payment must be included with order. This is an excellent way to sell your program or unwanted equipment, ask for help, or find a specific program. Send your ad with payment to QZX, 2025 O'Donnell, Las Cruces, NM 88001.

WANTED: TNC and/or TU for T/S 1000 to Kenwood TS820. Call Don, (314) 832-7434, Mornings.

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CONFESSIONS OF A SINCLAIR HAM JUNKIE!

by Bob Howard WA6DLI W.Covina, CA

If you are reading this you are probably a ham or SWL with a Timex-Sinclair computer, since that is the group that QZX was founded for by Marty Irons K2MI and taken over by Alex Burr K5XY, when Marty found he could not continue due to the success and growth of the newsletter. In England, there is SARUG, the Sinclair Amateur Radio User Group, chaired by Paul Newman, G4INP.

The original Sinclair ZX80 of 1980 was the first kit with a 4K ROM..it was superseded by the ZX81 of 1981 with 8k ROM and better construction. Timex, who manufactured the Sinclair in Scotland for Sinclair Research Ltd., saw the sucess of this powerful little computer at a bargain price and introduced it into the US under the Timex-Sinclair label as the TS-1000. It was a ZX-81 with 8k ROM and 2k RAM instead of the 1k RAM. The circuit board of a TS-1000 even says ZX-81 inside. When the 16K ram pack is added they are identical machines since the 1 or 2K RAM is bypassed by the added on RAM. A TS-1500 in an English "Spectrum" case with rubber keys instead of a membrane keyboard, followed at about the same time as the TS-2068 was being announced in 1983 or early 1984. The TS-1500 is a vastly improved ZX-81 with the 16K built-in and will take the 16K RAM in addition to make a 32K computer. The TS-1500 was probably the scarcest computer as it was sold for a very short time and only by dealers, as the TS-1000 was sold.

The TS-2068 Timex-Sinclair Color Computer was introduced for Christmas 1983, but was almost non-existant except in the Sears Catalog. Timex decided to introduce the "Spectrum" into this country and the first literature showed a "Spectrum" case. They called it a TS-2000 and it like the Spectrum was to be in 16k and 48K versions. They decided correctly that the Spectrum keyboard would not do and took a year to re-engineer the computer to a really advanced machine with bank switching, screen flipping (two display files), a cartridge dock, and a very good keyboard that is superior to the IBM Jr. keyboard because there are guides for the keys. The keyboard seems to be almost identical to the keyboard of the Brother EP-44 typewriter and is excellent for typing.

Unfortunately, the extra year of engineering made the TS-2068 introductory price of $199 seem non-competive to the Commodore 64 computer which in the year had dropped in price from $400 to $200. The Commodore 64 did have what appeared to be a "real" keyboard, and the TS-2068, which was only in the Sears Catalog, appeared to have the dreaded "Chiclet" keys, not much better the membrane keyboards of the Atari 400 and Timex 1000. Timex faced with a revolt by the mass mechandisers withdrew from the market. Only then did Timex 2068s become available in closeout prices from Timex by mail and the mail-order dealers that had been supporting the ZX-81 line in software. A few TS-2068 that had reached chain department stores on the east coast were also cleared out a bargain prices of about $149 to $129, which is still the going price if you find one, but usually a lot of software is thrown in.

It is estimated that 3.5 million ZX-80, 81, TS-1000's were sold worldwide. Spectrum and TS-2068 sales probably approach 2 million. The Timex Portugal factory is still making the 2068 as the TC-2068, and is rumored to have orders for 800,000 plus 200,000 disk drives for Poland to use in the schools and perhaps a similar order for Czechoslovakia. If these pan out, the Sinclair design will be the most widely distributed computer. The IBM has only sold 3 million according to their ads but the clones probably equal or exceed this about.

The Sinclair QL, or Quantum Leap, was Sir Clive Sinclair's next big brain child for the business world. (He was knighted by the Queen for the sucess of the Sinclair computers in the early years). Here he had production problems and was a year late to market with a machine that wasn't completely debugged. To meet the date promised a few machines were delivered to customers with a part of the circuit that didn't fit in the case plugged into an expansion port with an odd add-on box. These customers had their machines exchanged for proper ones later on. Because of the bugs in the first machines ROM and software, the press comments were not favorable, although all agreed that the comcept was first rate...a color MacIntosh type computer at a good price. The use of the built-in Microdrives did not look professional either. These were Sinclair's answer to the high cost of disk drives for the home computer. While they give the speed and simulate disks very well, the cartridges have some quality problems and while this was straighten out by the time the QL was introduced, the stigma stuck and QL sales were slow.

The Christmas of 1985 was doomsday for most home computer makers world wide as the rosy predictions from sales in 1983 and 1984, did not equate to sales in 1985. Perhaps the fad had waned like the CB phenomena, the "hype" most computer and software sales use was seen through, or people had other demands on their funds like the new VCRs, etc. Caught in this down-turn were even the new Spectrum Plus, which was a Spectrum with a QL keyboard, at last free of the rubber keys! In 1986 when the Commodore 128 was introduced (the only Commodore that approaches the Sinclair line in capability), Sir Clive in England introducted a similar Sinclair 128.

These machines and the new CoCo 3 (Radio Shack Color Computer) all are two machines in one. The "old" model in one mode and a "new" 128K computer with new ROM in the second mode. They are all incompatible in the new mode with the old mode so are really two computers. The Commodore 128 has a CPM mode that is incompatible with the 128 mode as well.

Sinclair sold out to Amstrad Business Computers in April 1986 to get funds to pay his creditors. Sinclair only sold the name and current computer designs to Amstrad. Amstrad had 20% of the British market and Sinclair 40%, so Amstrad has now 60% of UK. They did not acquire Sinclair Reseach Ltd. Out of this Amstrad will continue the Spectrum Plus with a new keyboard and a built in cassette recorder and joy-stick ports. It is called the Sinclair Spectrum Plus Two. The Spectrum 128 and original Spectrum Plus are limited to dealers stocks as is the QL.

Some groups are trying to get rights from Amstrad to continue the QL under license. There are about 100,000 QL's in owners hands. Enough to keep software and support alive perhaps. About the same as the Amiga by Commodore. The QL comes with four software programs that give you a Word Processor, Spreadsheet, Data Base, and Graphics program. This is worth the price of the computer as the same programs in England written in IBM form sell for $795. A QL needs an RGB monitor and serial printer. But a bargain computer allows you to get the best display and printer and equal anyone's computer.

Just before the Amstrad deal, an improved de-bugged American electrical and TV standard QL was sold by mail order from Sinclair's New England office...also by American Express. It is possible to get one of these from the 17 dealers supplied by A+ Computer Response, who made a deal with Sinclair for all the American computers that had been shipped for the American market. These dealers advertise in the various newsletters that support Sinclair-Timex user groups and the publications like QZX, Time Designs, TS Horizons, CTM, and Computer Shopper.

Now that you have had my thumbnail history of Sinclair-Timex computers...all orphans now except for the Portugal produced computers which Timex has the rights to market in North America, Eastern Europe and Asia, I can tell about my experiences and delights with the Sinclair line.

My first contact with computers was in Aerospace when we were bidding in 1964 and one of our partners bragged about their big computer with a 4 K memory that would make our team the one to go with! Later in 1977 I saw the first write-up on the Altair in Popular Electronics. I never did send for one although I had built the function generator kit sold my South West Technical Products. I think what put me off was that these computers were programed in true machine language until Bill Gates wrote a basic for it and went on to found Microsoft! Incidentally, the reason Commodore computers are poor is that Tramiel got his basic from Gates, when he was still wet behind the ears, without royalty on the computers sold, so Tramiel kept the early Pet basic in all the machines Commodore sold as there was no extra cost. This basic did not support the features of the Commodore 64, but Simon's basic written by an English kid could be bought and put it to handle sprites etc. Only Commodore Business Machines, in putting out the Commodore 128, added a new basic by Microsoft that is modern.

Now why did I imply that even the ZX81 might be the equal of a Commodore or Atari and certainly better than a TI-99 which had the worst basic of all. Well, the ZX-81 uses the Z80A which is a superior and later chip than the CPU in the Atari, Radio Shack or Commodore computers with more options to access. Secondly, the Cambridge based programmers that Sinclair hired for the job had a knowledge of Forth and the ROM has forth-like programing so it allows single keystroke words to be defined...a conveniece that has kept me from changing computers even to the QL, until now when I decided I had better get one while it exists in American form. Another pecularity of the Sinclair is that string length is limited only by memory so speedy file access is possible and the super string slicing can be used in many ways.

The main thing missing in the basic used in the ZX81/TS1000/1500 is the lack of DATA, READ, and RESTORE. There are ways to work around this that have been published in the newsletters. The usual time you miss these is when you are copying a program listing from a magazine and translating to the Sinclair basic. If you have a ZX81/TS1000 you can buy an expanded basic that adds a number of features to equal the Sinclair Spectrum. Send two IRC coupons (postage credit from post office) to Nick Godwin, 4 Hurkur Crescent, Eyemouth, Berkwickshire, Scotland, TD14 5AP for info on "ZX Extended Basic". Another extended basic is available directly from Thomas Woods, P.O. Box 64, Jefferson, NH 03583. This is the version I have and can recommend. I believe it was about $19 but check on the price with an SASE. If you are a dedicated ZX81/TS1000 user you should be taking the SyncWare News from Woods also at $16.95 for 6 issues.

My several TS1000s and ZX81 have wired on keyboards. One has a Memotech keyboard plug on. I have a 64k memory from Memotech, a CAI controller board for an Exatron stingy-floppy, with two Exatron drives, and the NU4V CW and RTTY software and interface boards. The ZX81 is normally connected to the ham rig and has its own monitor in the console. It is a TI color composite monitor so can show color from the 2068 which feeds it as well as its own RGB monitor. The ZX81/TS1000 can drive a monitor if you put a 10 microfarad electrolytic in series with the video feed to the modulator box, + to the video lead and connect the - to the center of a coax going to the monitor. The shield of the coax is grounded to the modulator box in the computer. This will work with most high impedance inputs. If it doesn't work then you will have to look up a circuit that includeds a transistor for low impedance output. See old Solomon column in Computer & Electronics magazine (defunct) cira 1984.

My ham log and CW operation is done entirely with the ZX81. Now I program mostly on the TS2068 unless I am doing a program for the ZX81, in which case I program on the ZX81 and I have a program from EZ Key called Upload that will convert it to load into the 2068 where I can add color commands and expand the graphics. The program VR85 Satellite Oscar program once published in QZX written by W6WNK was a ZX81 program that was embellished and colored for the TS2068 by this method. That program went on to be a popular program for the Commodore also. It has very good accuracy so if you haven't tried it look up your back issues of QZX! It will work on the ZX81/TS1000 if you leave out the color commands, orbit plot graphics and just leave the world map.

Radio Shack is again selling the TI99 keyboard that can be wired into a ZX81 or TS1000 for about $3.95. Just be sure it is the one that you can see the solder terminals of the keys on the bottom. One that is completely covered with plastic has a membrane keyboard switch and is no good. If you can't find a newsletter on how to wire it (TS Horizons, List, Sum, etc.) drop me a SASE and I'll send you a reprint from SyncWare News. An external keyboard will allow you to really do RTTY or CW using an interface from WD4HDT Bruce and software from NU4V, Cliff. Cliff had a hardware article for his RTTY interface in the April 1985 Ham Radio magazine. If your call book shows Bruce and Cliff to be in Ft. Walton Beach, Florida, then write to them with a SASE for info.

Before I leave the ZX81/TS1000 I should point out that with an external keyboard it is the best ham computer as it is small and can he hidden in a drawer with just the external keyboard visible. It is available widely in garage sales at $10-$35 often with the 16K ram pack or a TV set thrown in. It is well shielded for ham radio. The main problem of loss of program with ram-pack wobble is cured if the computer feet are extended so the ram pack cannot touch the table surface. With the CW and RTTY programs of NU4V it is a match for any computer. Also with the recent info in QZX on packet it is a good bet for that with the $55 RS-232 adapter advertised as the Comlink in QZX. The TS1000 is almost indestructable and can be battery powered. I should also mention that in addition to cassette the Exatron stringy-floppy is still available under the name A & J Microdrives in Sunnyvale. The newsletters carry ads for disk drive interfaces from Larken in Canada and AERCO in Texas. All interfaces for tl Sinclair line use the Western Digital controller chip that supports standard IBM Shugart type drives in 3, 3.5 and 5.25 inch sizes. This beats the socks off the Atari/Commodore line which usually only allow single sided drives and 170k formatting.

If you really want to fly with your TS1000/ZX81, then write Fred Nachbar, Mountain Station Group Box 12, Nelson, British Columbia, Canada V1L 5P1. (604) 354 3858 and send two IRC's and ask about his $99 package wherein he builds, assembles and tests the John Oliger colorboard to give your ZX81 capablilites exceeding the TS2068/Spectrum. He also has a basic to support the new features. This is for programming types as the Spectrum stuff won't work unless rewritten for the new operating system. You will notice the good programers live out in the wilds, not in some sweat shop in a city working for a computer maker.

Now onto the TS2068/Spectrum...first if you have these computers you can be glad that Amstrad is continuing with the Plus Two and not the 128, as programs for the 128 would soon exceed the capacity of the TS2068 and 48k Spectrum. With the Portugal Timex line and Amstrad line there will be hundreds of new programers developing out of the thousands exposed to the Spectrums all over the world and some of this may flow back to us in ideas, publications and software production!

I have three TS2068s, one at work and two at home. One of these is really a spare but my daughter uses it for word-processing so it may not survive forever either. I bought the first one from Sears and fell in love with it. All the good things of the ZX81 plus upper and lower case, and color with 35 more commands in Basic. The Sinclair basic evaluates variables as they are executed so can function as DEFFN anyway but the 2068 has this command as well. The trig functions in Sinclair basic are also complete..Microsoft basic is not, so formulae for navigation, astronomy and satellite tracking have to be refigured. Also Sinclair basic correctly labels natural log as LN. Microsoft basic uses LOG for LN as there no true LOG. The 2068 also has extra commands not on the Spectrum like FREE to obtain remaining memory. String slicing is neater using the TO function than the Awkward Right, Left and Mid of Microsoft basic.

It is essential if you have a Sinclair-Timex Computer, to do your own bird dogging for support as you will not find it in the corner store. This is the only advantage the Commodore might have. The Atari, other than the 520/1040ST seems to have vanished from the market also. Radio Shack is the best supported computer and Radio Shack stores are almost as common as service stations. For your TS2068 you must take some of the user group newsletters or magazines/journals such as QZX. I am afraid I might miss something so I subscribe to Time Designs, CTM, SyncWAre News, QZX, TS Horizons, and get newsletters from CATS, LIST, CAN (Computer Astronomy Network), SARUG, Synapse, and Triangle. I also subscribe to the English ZX Computing Monthly. Because of this I find bargains too! My AMDEK IIIA disk drive set can be had for $75, I just bought two 3.5 inch quad density drives for $75. My add on keyboards for the ZX81/1000 have ranged from $3.95 to $19, the later a Keytronics with glass enclosed reed switches in the keys. I did spend big bucks for the Memotech plug on keyboard but even got it at half price as Memotech withered away in this country.

The hardware kits from John Oliger Co. are super quality and design and include the before-mentioned color board, Eprom makers for ZX81/1000 and 2068, printer interface, disk drive I/O with a neat NMI circuit that saves programs to disk without having to decode them. At the expense of storage space on disk, his system for the 2068 gives superspeed and convenience. It saves any program in 24 seconds and recalls them in 4 seconds. Because it saves the entire state of the computer, each programs takes a full 49K. The convenience outways the conventional computer science approach of file handling. I have the Kempston Disk I/O also for use with Spectrum computers and while it is nice, it is a chore to convert tape programs that are protected to save them onto disk.

The Spectrum hardware can be used on a TS-2068 if you add an edge adapter such as Z-Link, and a ROM Switch. Software only will work with the cartridge Sinclair ROM. It is also necessary to have pull up resistors on some of the data lines to emulate the Spectrum. The newer Z-Link and ROM switches have these added. In fact I have one computer with pull up resistors installed under the ROM, and in the Z-Link apparently without harm as everything works. Now why would one want to emulate the Spectrum if the 2068 has more features? Well, two good reasons. First, the Spectrum by having less features than the 2068 has more memory for programs, 48K versus 38K in the 2068 (about same as Commodore 64). Secondly, there are perhaps 200 known programs commercially for the 2068, there are over 6000 for the Spectrum. While many are games you may not care about, numerous ones are business or computer science programs such as languages. Also there are many more high quality ham programs than we have seen in the US, from England, Germany, Sweden and where ever hams program Spectrums. For some reason top programers and Sinclair buffs seem to include ministers. Some examples I have had contact with or met in QZX are Kraig KA2HLO, Bob Hartung now

writing on Sinclair and BetaBasic in CTM (Computer Trading Magazine) but formerly a contributor to the glorius SYNC magazine. (Sync was killed after Ziff-Davis acquired the parent and Timex withdrew from the market.) They have dumped Computer and Electronics and some other magazines as the computer world shrinks. I got even by dumping Pop Photo and other Ziff-Davis Magazines and subscibed to Radio-Electrics. Oh yes, back to ministers, SM3HBQ who sells all the good English ham programs from Sweden is also a preacher. His Chara Electronics advertised in QZX some time back. He can be contacted at: PO Box 119, S 81 300 HOFORS, SWEDEN for Spectrum programs like G1FTU RTTY, CW and SSTV programs that require no interface..just hook the ear jack and "mike" jack of the computer to the transceivers mike and speaker sockets. He also has hardware interfaces for some of the Scarab programs. Again if you write send IRC or in the states SASE as most of our supporters are individuals with a business on the side and barely can afford to advertise.

I have a program that also decodes AMTOR, SSTV, CW, and RTTY from Wales. It is advertised in SARUG, the English version of QZX. Because of my few lines in CQ June 1986 page 90, I have met some more hams and shortwave listeners using Spectrums for satellite and weatherfax. The Atari magazine Antic recently had a whale of an article on WeFax as it is called for the Atari, but the info is of interest to hams and SWL that want to receive satellite and ground transmissions.

It would be well to state here than I am not a Sinclair/Timex fan just for the low cost of the computer as might be the great number of university students...most good user groups center around college towns. I can afford any computer I wished and use IBM clones at work...except that I have my 2068 at my desk and rarely ever have to touch an IBM type as I can do better output and quality with some of the Spectrum programs I have. I use the Sinclair Interface 1 with Microdrives and print to an EP-44 Brother typewriter which is slow but has quality as good as the $600 Toshiba 321 when I use the thermal ribbon.

My graphs produced with Omnicalc and Figaro programs are better than the crummy graph that Lotus 1-2-3 draws. I have told them at work that I wouldn't carry one of the business computers we use home if it was given to me. We just got these computers in 1985 and I have been programing a computer at work since 1983. Because my computer caught errors in the telephone companies main frame we won a regulatory decision so the Sinclair/Timex beat the main frame computer because they did not have a graphics output to see the error that had been built in by a faulty trend equation. Of course, it was really a case of inattention by the people doing the work..but it got respect for the Timex!

(contd next month)

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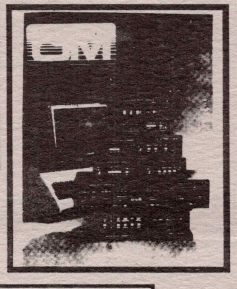

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